

3M Separation and Purification Sciences Division

3M™ DF Series Filters save distiller time and money in de-charring application.

The problem

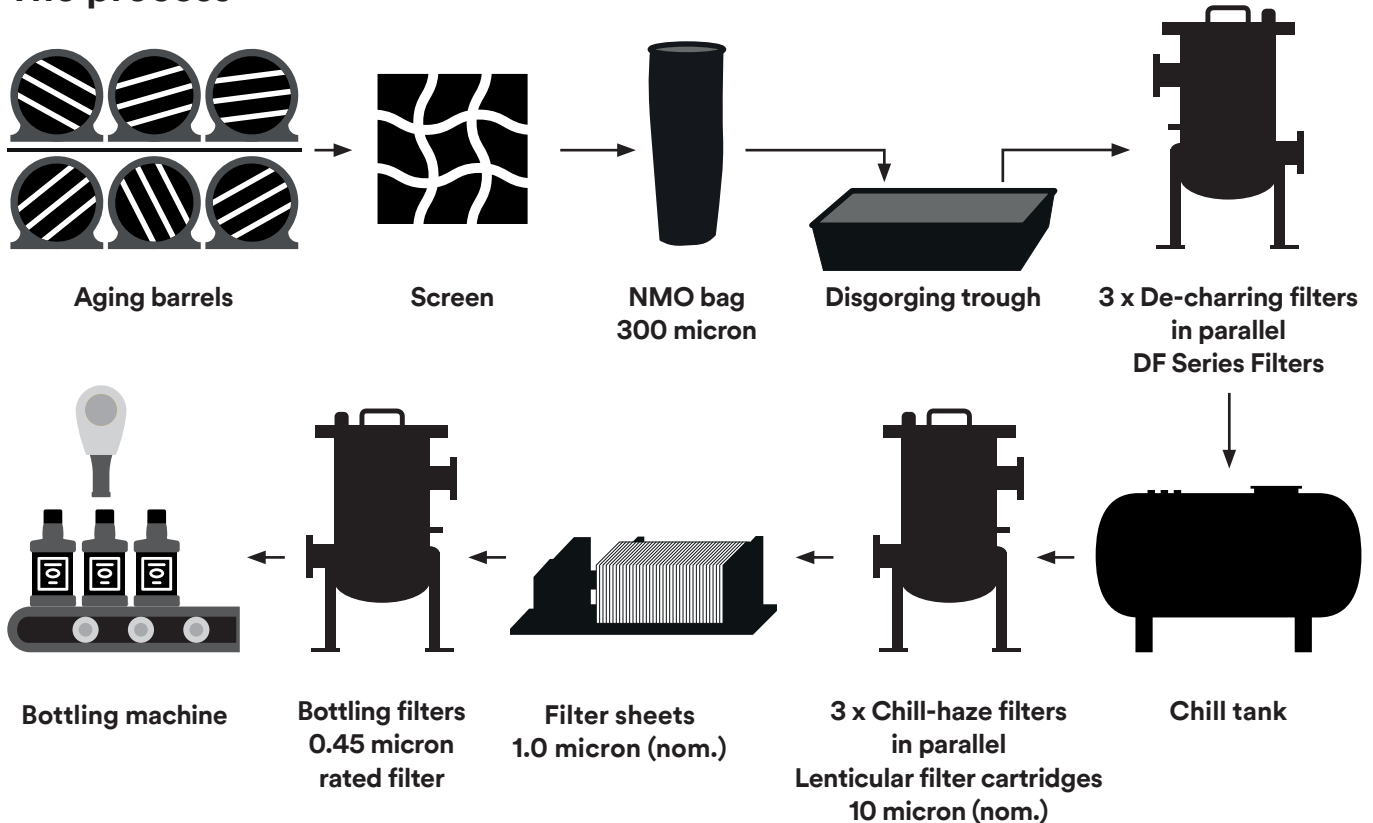
Whisky (or whiskey) production has ancient roots in Europe. Records indicate that it was being produced at least by the 15th century in both Ireland and Scotland. However, modern whisky is now produced in many countries around the world, with many classes and types that are strictly regulated. Malted barley has been historically the main fermentation source, but corn (maize), wheat, rye and other grains in various combinations can also be used. After fermentation, most whiskys are aged in charred oak barrels for a period of time – sometimes as long as 20 years or more.

Wood selection, the type of charring of the barrel interior, the length of storage in the barrel, temperature and other factors all play roles in the taste of the final product. The charring of the internal wood surface creates important flavour compounds, like vanillin, tannins and spices, while also helping to remove less desirable compounds from the spirit, such as sulphur. As the temperature of the storage location fluctuates, the whisky is forced into and out of the pores in the wood, and through the charred layer, picking up various organic molecules that will ultimately change the flavour and colour of the spirit. Master Distillers and Blenders often spend decades learning how each facet of the process can yield a world class whisky.

Once the Master Distiller and Blender deem the whisky ready for bottling, the barrels are emptied one by one into a receiving trough. This process, called disgorging, also results in a quantity of the barrel char remaining in the whisky. One large distiller was using a competitive polypropylene depth filter to “de-char” the whisky before it went on to the next process step called Chill Haze Removal. They reported the filter was moderately effective, but needed to be replaced frequently (sometimes once per day), and was also quite messy, since the barrel char was trapped on the external surface of the filter.



The process



The solution

3M recommended the 3M™ DF series filter to improve results of the decharring step.

Depending on the nature of the char, the distiller used either the 1 micron or 5 micron version. To handle the maximum flow rate the system would experience, three housings were piped in parallel for the trial.

The novel design of the 3M™ DF series filter directs the process flow inside the space between the two filter layers, thereby trapping particles within the filter, rather than on an external surface, as with conventional filter cartridges. Additionally, the true graded porosity media construction helps increase holding capacity compared to that of non-graded porosity filters.

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The result

The distiller reported that the 3M DF Series Filters typically lasted for 2 weeks or more before being changed – a significant improvement over the previous filters. Additionally, the operators commented that with the 3M DF Series Filters, the barrel char was trapped within the filter, making it much cleaner to change than the previous filter. Lastly, they commented that the filtrate from the 3M DF Series Filters was cleaner, compared to filtrate from the previous filter. Delivering a cleaner filtrate to the next stage of filtration, chill haze removal, would likely improve the process economics.

Overall, the distiller estimated that the change to the 3M DF Series Filters resulted in a 75% decrease in the cost of filtration in the de-charring stage.

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